State of the Laboratory

DIRECTOR'S STATEMENT

C. Bruce Tarter
Director

As these words are being written, the Galvin Task Force on Alternative Futures for the DOE laboratories is in its final phase, C. Bruce Tarter was recently selected as the eighth Laboratory Director, and Secretary of Energy Hazel O'Leary has just announced Key Decision One to proceed with planning for the proposed National Ignition Facility with Livermore as the preferred site. These events, and those that preceded them, are characteristic of the magnitude of the changes that are occurring in one of the most turbulent and stressful periods in the history of the Laboratory. Despite this turmoil, the technical accomplishments of the past year have been extraordinary. In addition, the Laboratory has developed an overall strategic vision that provides the architecture for our future planning.

Most of the Laboratory's scientific and programmatic achievements of the past year are discussed in the sections that follow, but a few deserve special mention here. Perhaps the most significant is the development of the case for the proposed National Ignition Facility (NIF), in which 192 laser beams will focus their immense power to implode small targets of deuterium and tritium and produce fusion. This facility will be a centerpiece of our science-based program on stockpile stewardship and provide a superb laboratory for basic science. It also has the potential to establish the scientific feasibility of inertial fusion as a long-term energy source for the nation. Department of Energy (DOE) Secretary O'Leary's October 21 signing of Key Decision One allows us to proceed with vigorous planning for this major facility.

On a purely technical note, the remarkably successful Clementine lunar mission represented a tour de force for the technologies that LLNL developed under the sponsorship of the Ballistic Missile Defense Organization. All seven cameras deployed on the mission were designed and built by the Laboratory, and the first complete mapping of the lunar surface (which has provided a reservoir of data that will occupy scientists for years to come) was carried out with these cameras. Our education program has been instrumental in making this data electronically available to the broad public through the Internet.

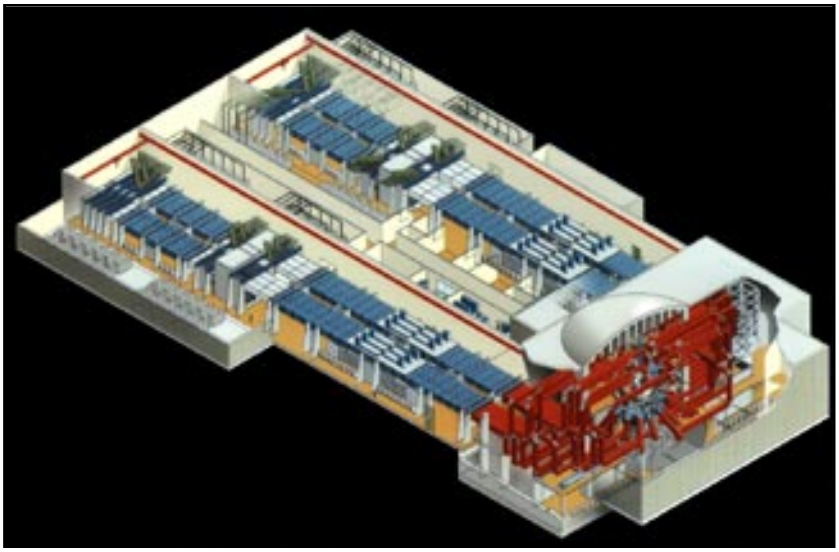
Finally, the United States Enrichment Corporation has decided to commercialize our AVLIS (Atomic Vapor Laser Isotope Separation) process, successfully culminating our years of work to develop a process for cost-effectively and cleanly separating the isotopes of uranium for use in fission reactors. This decision will lead to further work by the Laboratory in demonstrating a pilot plant for the process.

Programmatic Planning

In June 1994, we published a document entitled *Framing the Laboratory's Future: A Vision for Lawrence Livermore National Laboratory*. This vision statement is the first formal step in laying out our strategic vision for the future. It focuses on three broad areas:

- Global security and reducing nuclear danger.
- Global ecology and harmonizing energy and economic development with the environment.
- Bioscience and applying understanding of human health.

The first of these missions—global security—represents the transformation of our historical nuclear weapons effort for the post-Cold War era. There are three important tasks, all directed at the overall goal of reducing nuclear danger throughout the world: stewardship of the stockpile, development of measures against



The proposed National Ignition Facility will be a cornerstone of our stockpile stewardship program. It will also allow for the evaluation of inertial fusion energy as an energy source and for experiments in basic science.

nuclear proliferation, and safe dismantlement of a significant fraction of the strategic arsenal.

Collectively, these important national security responsibilities will challenge our scientists and engineers in the post-Cold War era just as strongly as did our historic mission in nuclear design and testing. During the past year, we have worked very aggressively in concert with the Department of Energy and the Los Alamos and Sandia laboratories to develop an integrated joint program to accomplish these objectives. Of particular note is the innovative program in science-based stockpile stewardship. The absence of nuclear testing requires a much deeper understanding of nuclear weapons science to ensure the safety and reliability of the stockpile. This, in turn, will require new experimental and computational facilities to provide a much more accurate predictive capability for the behavior of weapons. The National Ignition Facility, the first of these proposed new facilities, will greatly enhance our knowledge of weapons physics and will give us a tool to address important stockpile issues.

The second major theme—global ecology—provides an organizing principle for our diverse activities in energy and the environment. Within the Department of Energy (and the other relevant federal agencies) many important projects on energy, transportation, manufacturing, and other technical areas are closely tied to economic development. There are also substantial and varied environmental programs, ranging from waste cleanup and environmental restoration to global climate change research. In addition, there is a large effort devoted to developing, implementing, and ensuring compliance with the labyrinth of environmental regulations.

Our goals in these broad areas are threefold: to provide an improved technical basis for establishing environmental guidelines, to develop the science and technology needed to achieve progress in individual projects and programs, and to organize and articulate the results of our work in the context of an ecological perspective consistent with economic growth. Pragmatically, we also believe such an approach will lead to much better mechanisms for effective funding and for applying the skills we and the other national laboratories have developed in doing large-scale applied science. Putting this integrated approach together and translating it into an action plan is a major goal for the coming year.

Our third focus area—bioscience—is growing rapidly in large measure because of our extremely successful work on the Human Genome Project. The distinguishing feature of our activities in this area has been the embedding of excellent bioscientists in a physical science and engineering infrastructure. To this end, we have added a new structural biology program to explore the physical basis for some of the genome project's results. We have also established the Center for Health Care Technologies to apply the many innovative engineering and diagnostic techniques available from our other programs to the emerging national mission in cost-effective health care. Some

examples of our health-care accomplishments include improved mammography techniques, advances in medical lasers, and the use of microengineering techniques to repair aneurysms.

Institutional Planning

Perhaps the most difficult task facing the Laboratory is the transition from an institution in which the design and testing of nuclear weapons were our defining rationale to an organization in which the focus of nuclear weapons has changed dramatically, and a multiplicity of programs and customer interests all have significant value. Programmatically, this cultural shift must be accomplished with well-articulated roadmaps in each of our areas of technical emphasis and a set of long-term goals that give meaning to our efforts. It is the purpose of our future strategic planning to integrate national priorities, the DOE mission, and the ideas of the employees into such a detailed vision.

Operationally, there are two basic challenges. First, we must radically restructure our human-resource, business, and site-planning practices to reflect this new multipolar world. Specifically, these practices must enable the Laboratory to respond to a diversity of evolving missions with cost-effective and institutionally friendly methods of interacting with our sponsors. Second, we must respond to the different requirements of a plethora of customers and stakeholders—the fundamental need for accountability of a public institution, the interests of the state and the local community in which we live, the use of our resources and talents to further the technical progress of the nation, the programmatic expectations of those who work, and a commitment to respect the ideas of each individual staff member. All of these principles are embodied in the nature of our long-term management by the University of California, a relationship that continues to strengthen as we move into this new era.

In summary, the future Laboratory will be a more complicated and more diverse organization, even though our overriding mission—serving the nation through the application of science and technology—will not change. Our aim is to create a Laboratory that continues to attract and stimulate the best researchers in the world, where technological achievement is the highest priority, and where efficient and cost-effective systems are the means to accomplish our objectives. Achieving those goals will require major qualitative changes, both functional and cultural, but the resulting institution will serve as a model for national laboratories.

The Clementine Satellite sent back more than 1.5 million images of the moon at resolutions never before attained. These images were taken with cameras designed by the Laboratory.